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# *Dryopteris jiucaipingensis* (Dryopteridaceae), a New Species in *Dryopteris* sect. *Hirtipedes* from Guizhou, China

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**ABSTRACT.** A new fern species, *Dryopteris jiucaipingensis* P. S. Wang, Q. Luo & Li Bing Zhang (*Dryopteris* Adans., sect. *Hirtipedes* Fraser-Jenk.; Dryopteridaceae), is described and illustrated from northwestern Guizhou, China. *Dryopteris jiucaipingensis* is most similar to *D. lunanensis* (Christ) C. Chr., but the former taxon has light brown rachis scales and occurs in alpine regions (at an elevation of 2580 m), while the latter has nearly black rachis scales and is found in montane and lowland areas (below 900 m).

**Key words:** China, *Dryopteris*, Guizhou, IUCN Red List, section *Hirtipedes*.

In the summer of 2011, Qiang Luo conducted fieldwork in Jiucaiping (the Leek Terrace), the highest peak in Guizhou Province, China. Specimens of a species of *Dryopteris* Adans. (Dryopteridaceae) collected on this trip drew his attention, and he then showed these specimens to Pei-Shan Wang. After extensive morphological study, he concluded that the species was morphologically similar to, but different from, *D. lunanensis* (Christ) C. Chr. Later, photographs and DNA material were sent to Li-Bing Zhang. Our morphological study suggests that the species of *Dryopteris* from Jiucaiping represents an undescribed species, which we describe herein.

***Dryopteris jiucaipingensis*** P. S. Wang, Q. Luo & Li Bing Zhang, sp. nov. TYPE: China. Guizhou: Hezhang Co., Zhushi Yi Autonomous Xiang, Luobu Stone Forest Sinkhole, 26°49'17.76"N, 104°44'8.19"E, acidic soil, 2580 m, 2 Oct. 2011, Q. Luo 1061 (holotype, CDBI; isotype, BJ). Figure 1.

**Diagnosis.** *Dryopteris jiucaipingensis* P. S. Wang, Q. Luo & Li Bing Zhang is most similar to *D. lunanensis* (Christ) C. Chr., but the former is distinguished by leaf blades of 63–68 × 24–27 cm and light brown rachis scales,

while the latter has leaf blades of ca. 48 × 30 cm and nearly black rachis scales.

Plant perennial, caespitose, 1.1 m tall or taller; rhizome erect, ca. 6 cm, 1.4–2 cm diam., glabrous; petiole 44–45 × 0.8–1 cm at base, dark brown and glabrate at base, light brown and scaly acropetally; petiole scales narrowly lanceolate and filiform, light brown, margin slightly ciliate. Leaves 15 to 20 per rhizome, blades oblong to narrowly ovate, 1-pinnate, 63–68 × 24–27 cm at middle, slightly contracted toward base, abruptly narrowed to a pinnately acuminate apex; rachis 3–4 mm diam., light brown, with dense, narrowly lanceolate to linear, filiform scales, ca. 7 × 0.9 mm; pinnae in 20 to 25 pairs, narrowly elliptic, herbaceous or thinly papery, slightly ascending, basal 2 or 3 pairs opposite, the upper pairs alternate, lobed shallowly to lobed halfway to pinna rachis (sometimes pinnatipartite at pinna bases), acuminate at apex, symmetric and broadly cuneate or shallowly cordate at base, stalked; pinnae at mid-portion of leaf blade largest, 13–14 × 2.5–3 cm; pinnae in lower portion of leaf blade slightly contracted; basalmost pinnae 10–12 × 2.5–3 cm; pinnae adaxially dark green when dry, glabrous, abaxially yellowish green, with sparse microscales; microscales brown, hairlike, ca. 0.4 mm; pinna rachis sparsely with filiform scales; pinna lobes to 15(to 20) pairs, oblong, obtuse and toothed at apex, entire laterally; venation pinnate, lateral veins unbranched on lobes, those on adaxial surface glabrous, those on abaxial surface ± with filiform scales. Sori 0.8–1.2 mm diam., 1–2.8 mm apart from each other, round in shape, in multiple rows on each side of pinna rachis, 1 row on each side of vein on lobes, 2 to 5 per row; sporangia 0.08 mm diam.; indusia reniform, 0.4–0.8 mm diam., thin, yellowish green when young, dark brown when mature, persistent; number of spores per sporangium unknown.



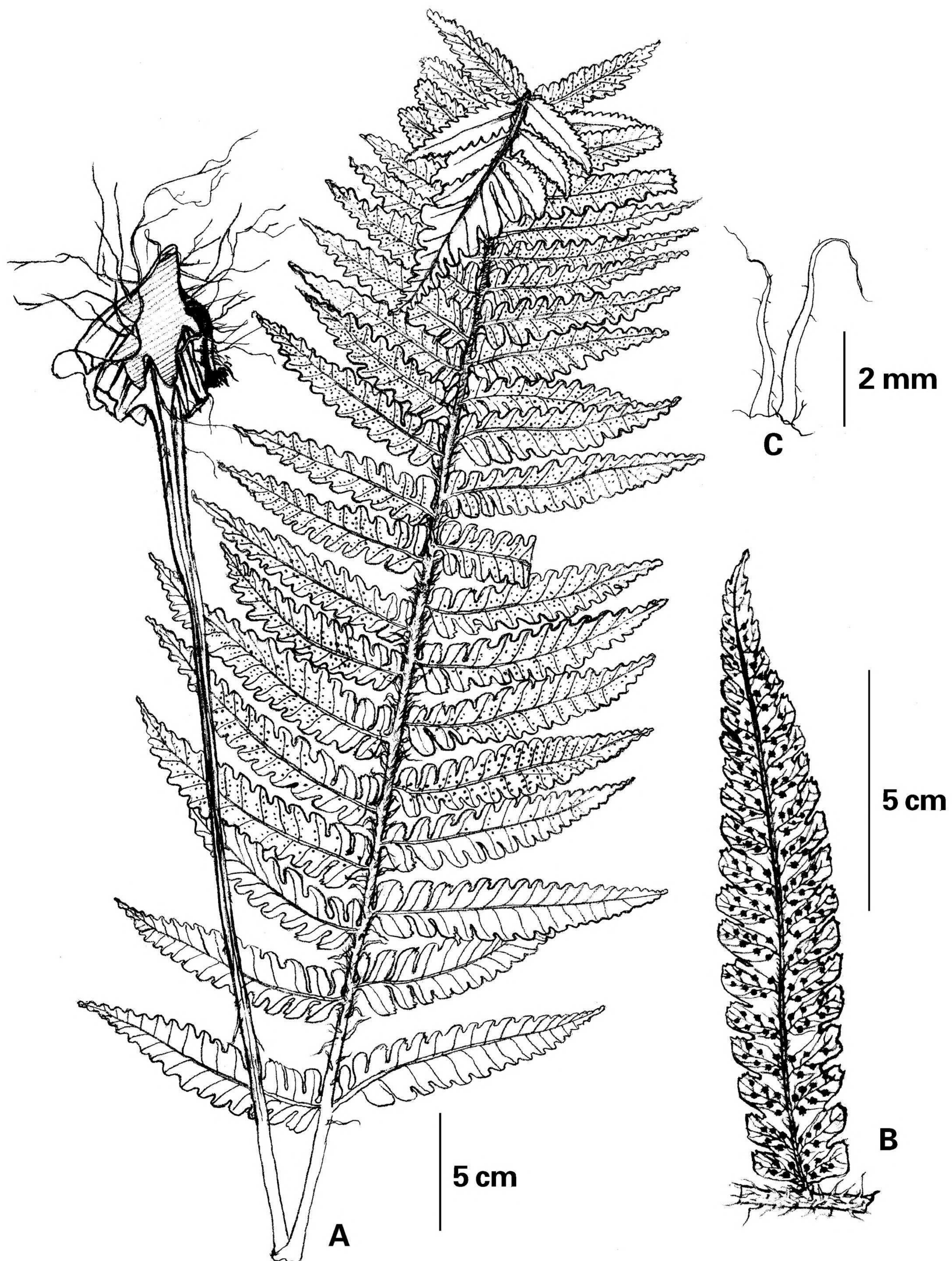


Figure 1. *Dryopteris jiucaipingensis* P. S. Wang, Q. Luo & Li Bing Zhang. —A. Habit. —B. Portion of rachis showing pinna at mid-portion of leaf blade. —C. Rachis scales. Drawings taken from the paratype Q. Luo 1024 (BJ).

*Distribution and habitat.* *Dryopteris jiucaipingensis* is known only from the type locality in Luobu Stone Forest Sinkhole, Zhushi Yi Autonomous Xiang, Hezhang County, in northwestern Guizhou. The unique habitat at high altitude and in moist,

low-light conditions at the karst sinkhole suggests that *D. jiucaipingensis* is endemic to this sinkhole. *Dryopteris jiucaipingensis* was noted in acidic soil near a large rock inside the sinkhole, at an elevation of 2580 m.



*IUCN Red List category.* Only one population of *Dryopteris jiucaipingensis* with ca. 100 individuals was found. The new species should clearly be classified as CR or Critically Endangered, according to the International Union for Conservation of Nature and Natural Resources guidelines (IUCN, 2008). The Luobu Stone Forest Sinkhole is not particularly known as a tourist attraction, but occasional visitors in summer could easily cause damage to the fragile habitats inside the sinkhole.

*Etymology.* The epithet of the new species is taken from the Chinese pinyin “jiucaiping,” for the name of the highest peak in Guizhou Province.

*Discussion.* Based on the 1-pinnate leaf lamina, symmetric pinna bases, unbranched lateral veins on lobes, and the pinnae that are lobed shallowly or lobed to only half their depth, *Dryopteris jiucaipingensis* is clearly a member of *Dryopteris* sect. *Hirtipedes* Fraser-Jenk. Fraser-Jenkins (1986) listed 17 species in *Dryopteris* sect. *Hirtipedes* worldwide, 14 of which occur in China. Wu and Lu (2000) later recognized 19 species for their *Flora of China*. Iwatsuki (1995) recognized a few additional species for *Flora of Japan*. *Dryopteris jiucaipingensis* differs from any of these species as known so far. In terms of the dissection of the pinnae and the number of pinna pairs per leaf lamina, *D. jiucaipingensis* appears to be similar to *D. lunanensis*. However, *D. jiucaipingensis* has leaf blades of 63–68 × 24–27 cm and light brown rachis scales, while *D. lunanensis* has leaf blades of ca. 48 × 30 cm and nearly black rachis scales (Wu & Lu, 2000). Also, *D. jiucaipingensis* grows at much higher elevation (ca. 2580 m) than *D. lunanensis* (below 900 m; Wu & Lu, 2000). *Dryopteris jiucaipingensis* is also similar to *D. conjugata* Ching with its light brown rachis scales and pinnae that are usually shallowly lobed to halfway lobed, but sometimes completely lobed, but the former has 20 to 25 pairs of pinnae per leaf lamina, while the latter has 30 to 40 pairs of pinnae per leaf lamina.

In addition to *Dryopteris conjugata*, *D. jiucaipingensis*, and *D. lunanensis*, there are four species in *Dryopteris* sect. *Hirtipedes* in China with pinnae usually shallowly lobed to halfway lobed, and sometimes pinnatipartite at the pinna base, with unbranched lateral veins on the lobes: *D. hangchowensis* Ching, *D. microlepis* (Baker) Ching, *D. paralunanensis* W. M. Chu ex S. G. Lu, and *D. thibetica* (Franch.) C. Chr. *Dryopteris hangchowensis* occurs in Zhejiang Province in eastern China and Japan, *D. microlepis* is known from Guizhou and Yunnan provinces, *D. paralunanensis* is known from only Yunnan, and *D. thibetica* has been collected

from Gansu, Sichuan, and Yunnan, although not from Tibet (Wu & Lu, 2000). These seven species can be distinguished from one another by the following key.

KEY TO *DRYOPTERIS LUNANENSIS* AND ALLIES IN CHINA AND JAPAN

- 1a. Lower fertile pinnae with 1 or 2 rows of sori on each side of pinna rachis ..... *D. hangchowensis*
- 1b. Lower fertile pinnae with multiple rows of sori on each side of pinna rachis.
  - 2a. Pinna lobes broadly deltate, separated by obtuse angles; sori arranged in a V-pattern on each pinna ..... *D. thibetica*
  - 2b. Pinna lobes oblong, separated by acute angles; sori 2 to 6 rows along pinna rachis.
    - 3a. Rachis scales nearly black; leaf blades ca. 48 × 30 cm ..... *D. lunanensis*
    - 3b. Rachis scales light brown to dark brown.
      - 4a. Petiole and rachis scales narrowly subulate or hairlike; leaf blades 25–50 × 10–20 cm ..... *D. microlepis*
      - 4b. Petiole and rachis scales usually lanceolate to linear.
        - 5a. Pinnae in ca. 17 pairs, falcate-lanceolate; leaf blades ca. 30 × 16 cm ..... *D. paralunanensis*
        - 5b. Pinnae in 20 to 40 pairs, narrowly elliptic; leaf blades larger than 60 × 24 cm.
          - 6a. Pinnae to 25 pairs; pinna lobes to 15(to 20) pairs ..... *D. jiucaipingensis*
          - 6b. Pinnae 30 to 40 pairs; pinna lobes to 25 pairs ..... *D. conjugata*

*Paratypes.* CHINA. **Guizhou:** Hezhang Co., Zhushi Yi Autonomous Xiang, Luobu Stone Forest Sinkhole, 2580 m, 10 June 2011, Q. Luo 1024 (BJ, MO).

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